2018-04-18

Naval Postgraduate School Field Experimentation

Scott, Gerald

Naval Postgraduate School
Field Experimentation

Director

Dr. Ray Buettner
rrbuettn@nps.edu | (831) 656-3387

http://nps.edu/fx

NPS – FX Supports Continual Innovation in DoD

The purpose of NPS-FX is to create a collaborative, boundary-pushing environment to explore the implications and applications of emerging technology. It is not about any particular technology or solution.

"...Improve the Department's ability to be innovative and responsive....provide agile ad rapid acquisition capabilities." *James Mattis, 17 Feb, 2017*

"Drill tunnels through that wall that sometimes seems to separate government from scientists and commercial technology." *Ashton Carter, 9 Sep , 2015*

NPS Field Experimentation (FX) Chronology at a Glance

SURVEILLANCE AND TARGET ACQUISITION NETWORK

STAN: 2003-2004

Tactical Network Testbed

TNT: 2004-2013

RELIEF: 2009-2013

Research & Experimentation for Local & Intl. Emergency & First Responders

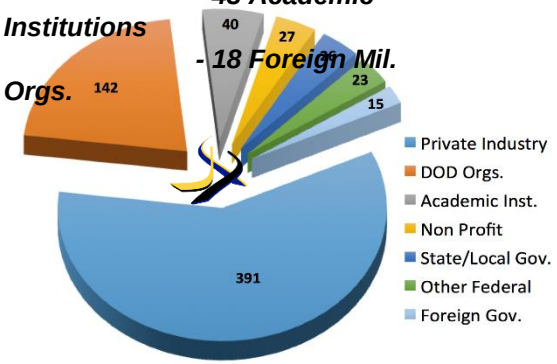
Ex-ART/TSOA

ASALT Expeditionary-Adaptive Red Team /Technical Support and Operational Analysis

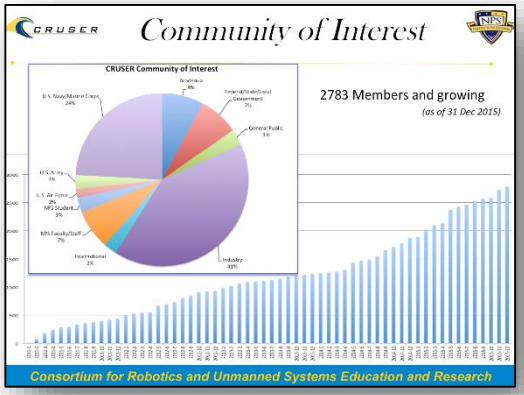
Joint Interagency Field Experimentation

JIFX: 2012-2017

~$2M Annual Research Program
> 600 Field Experiments (Air-Land-Sea)
> 3,800 Participants
- *423 Companies*
- *156 DOD Organizations*
- *28 Other Fed.*
- *26 State/Local Gov*
- *32 Non Profit Orgs.*
- *43 Academic Institutions*
- *18 Foreign Mil. Orgs.*



- $28M Research Program
- *5,122 Participants (2011-2013)*
- *~ 1,100 Field Experiments (Air-Land-Sea)*
- *140+ Theses*
- *90+ Professional Research Papers*



CRUSER: *2011-Present*

Consortium for Robotics & Unmanned Systems Education & Research

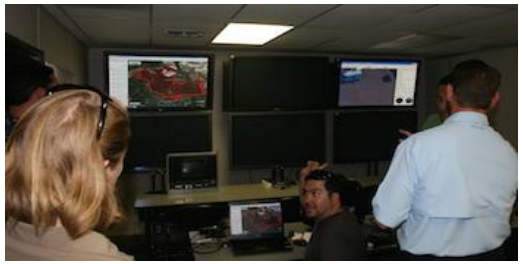
Resources

Physical Spaces

- Networked "Technical Operations Center"
- Presentation/briefing rooms
- Conference space including meeting tables, white boards, LCD screens
- Paved runway, restricted airspace & air traffic control to accommodate both manned and unmanned flights
- Large open ranges with varied topography and a quiet RF spectrum
- Firing ranges supporting numerous different ballistic activities
- Shipboard maritime environment
- Mock urban environment varied buildings, tunnels and rubble piles

Communications and Power

- Wired and wireless network connectivity
- Mesh network extending connectivity across a large area of open range
- Power at building locations, generators available for dispersed locations
- Two way radios



Goals

Build and maintain a multi-institutional, semi-structured learning environment for field experimentation in order to:

- Foster innovation and collaboration across government, industry and academia.
- Help government explore emerging technologies.
- Inform developers about emerging national security challenges.
- Provide a robust easy access venue to support rapid prototyping and experimentation.
- Build trust and mutual understanding between diverse communities of developers.

L-03: Fulcrum Community for Mobile Date Collection during Dis… Response Operations

Naval Postgraduate School Field Experimentation (FX)
NPS FX 18-2 | 26 February – 2 March 2018 | Camp Roberts, CA

PROJECT INFORMATION

Organization Name: Spatial Networks, Inc.
POC: Joe Larson, 805-459-1487, joe@spatialnetworks.com
Funding Source?: Internally
JIFX RFI Focus: L. Humanitarian Assistance (HA), Disaster Response (DR), Defense Support to Civil Authority (DSCA), and pandemic response
Capability Currently Used By: US Military, Government First Responder Organizations, Other Federal Entities, Private Industry, Non-Profits/NGOs

PROPOSED EXPERIMENT OVERVIEW

- The primary capability that our experiment proposes to explore is for local government emergency response/emergency service agencies to field test their damage inspection data collection processes prior to an actual event.
- Fulcrum is a smartphone application for Android or iOS to collect structured data in the field, either online or offline and quickly sync data to the cloud once the device has returned to a connected environment.

TECHNICAL INFORMATION

Hardware
bring your own device (BYOD) smartphone/mobile phone devices

Software
N/A

B-15: Advanced Two-Way Acoustic Communicator ("ATAC")

Joint Interagency Field Experimentation
JIFX 15-2 | 09–13 February 2015 | Alameda, CA

PROJECT INFORMATION

Organization Name: Sonitus Technologies Inc.

POC: Kurt Carlson **|** kurt@sonitustechnologies.com **|** (650)799-1053

Website: N/A

Funded Program?: Federally funded - IQT

Government Owned, Proprietary, or Open Source? Proprietary

JIFX RFI Focus: B: Command, Control, Communication, Computers / Situation Awareness (C4/SA)

Capability Currently Used By: Not yet fielded

PROPOSED EXPERIMENT OVERVIEW

- ATAC is an ears-free, concealable, wireless communications system effective in any challenging environment. ATAC is designed to replace headsets and remove cables thereby enhancing situational awareness and freedom of movement.
- ATAC is the leading technology that provides an ears-free, in-the-mouth fully concealable wireless communications capability for the IC and SOF communities. These sets of capabilities are unique and not found in currently fielded communications.
- Type of experiment: End-user Evaluation

TECHNICAL INFORMATION

Hardware

- **Dimensions:** Tiny
- **Weight:** Ounces
- **Power:** None (internal batteries)

Software

- **Required Processor (optimal performance):**
- **File Size/connection speed:**
- **Interoperable Standards:**

A-07: VTOL Air Cargo Logistics System – Robotic Cargo Syste

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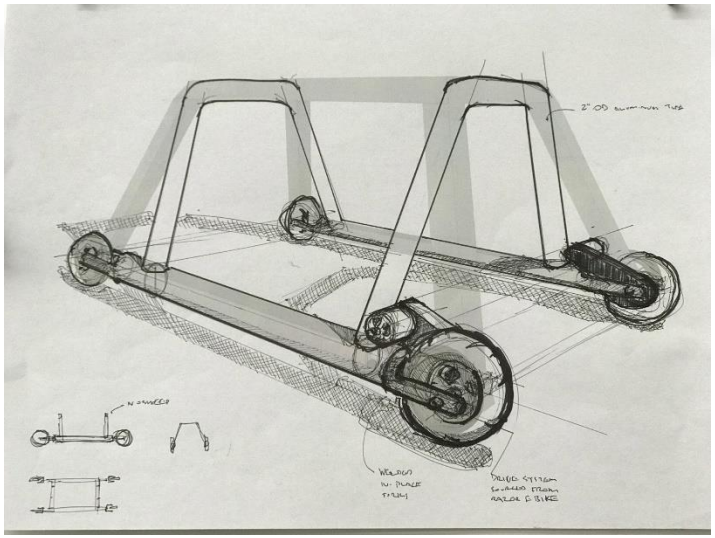
NPS FX 18-2 | 26 February – 2 March 2018 | Camp Roberts, CA



PROJECT INFORMATION

Organization Name: Elroy Air
POC: David Merrill, 415-938-6701, dave@elroyair.com
Funding Source?: Internally
JIFX RFI Focus: A. Unmanned, semi-autonomous, and autonomous systems design, deployment and operations
Capability Currently Used By: The capabilities being explored are not yet fielded

PROPOSED EXPERIMENT OVERVIEW

- Specializing in heavy payloads of 150+ lbs and an initial delivery range of 300 miles, Elroy Air's system is applicable to military re-supply, cargo transport for disaster relief, re-supply for crews fighting forest fires and commercial package logistics.

- By the JIFX dates the design and engineering teams will have iterated through a number of mechanism concepts for the robotic cargo system, and we will be bringing the most promising to date.

TECHNICAL INFORMATION

Hardware
Dimensions: approx. 3' wide x 8' long x 4' tall
Weight: 200lbs
Operated by short-range 802.15.4 wireless, using a controller with joysticks
Powered by onboard batteries

Software
N/A

A-03: Endurance testing of the APEX UAS

Joint Interagency Field Experimentation
JIFX 16-4 | 8-12 August 2016 | Camp Roberts, CA

PROJECT INFORMATION

Organization Name: L3 Unmanned Systems
POC: Brian Anderson| D.Brian.Anderson@L-3com.com | 214-232-0361
Website: www.L-3com.com/uas
Funded Program?: Internally funded
Government Owned, Proprietary, or Open Source? Proprietary
JIFX RFI Focus: Larger UAS (Class I/II)
Capability Currently Used By: Military

PROPOSED EXPERIMENT OVERVIEW

- The APEX/Orbiter 3B UAS provides Group 3 SUAS capability in the logistics footprint of Group 1/2 SUAS platforms and launch/recovery capability that allow runway independent operations.
- This technology is based on existing battery technology that is being packaged for this application.
- Hypothesis testing: Recent changes to the APEX propulsion system will allow users to take advantage of enhanced endurance. This experiment will help quantify these endurance gains.

TECHNICAL INFORMATION

Hardware

- **Dimensions:** Wing Span 165", Length 59"
- **Weight:** 71 lbs
- **Power:** Electric

Mission description

- Long endurance test with new batteries

Crew requirements

- One Internal Pilot (1)
- Ground Technician (2 minimum)

A-8: Autonomous, multi-micro-UAVs for ISR in indoor environments

Joint Interagency Field Experimentation
JIFX 16-4 | 8-12 August 2016 | Camp Roberts, CA

PROJECT INFORMATION

Organization Name: Shield AI, Inc.
POC: Brandon Tseng | Brandon.Tseng@shieldai.com | 407-415-3713
Website: www.shieldai.com
Funded Program?: Internally funded
Government Owned, Proprietary, or Open Source? Proprietary, open source
JIFX RFI Focus: Autonomous swarm micro-UAVs
Capability Currently Used By: None

PROPOSED EXPERIMENT OVERVIEW

- With this experiment we are exploring the utility of using efficient inertial simultaneous localization and mapping to enable multi-robot autonomous reconnaissance in combat and dense urban environments, building interiors, and GPS-denied areas
- This is a new technology that builds upon technology that has been demonstrated at the university level, but has yet to be commercialized for defense applications or consumer products. No autonomous solutions for defense mUAVs exist today.
- Interoperability verification: Our experiment will demonstrate how mUAVs can provide ISR when enabled with autonomy software

TECHNICAL INFORMATION

Hardware
•**Dimensions:** 7” x 7”
•**Weight:** 750 grams
•**Power:** Battery powered
Software
•**Required Processor (optimal performance):** N/A
•**File Size/connection speed:** N/A
•**Interoperable Standards:** Software is embedded on hardware platform for purpose of demonstration

A-04: DroneFox

Naval Postgraduate School Field Experimentation (FX)
NPS FX 17-4 | 31 July – 4 August 2017 | Camp Roberts, CA

PROJECT INFORMATION

Organization Name: WhiteFox

POC: Luke Fox, (916) 505-9591, luke@whitefoxdefense.com

Website: www.whitefoxdefense.com

Funded Program?: Other

Funding Source? Proprietary

JIFX RFI Focus: A – Unmanned, Semi-Autonomous, and Autonomous Systems

Capability Currently Used By: N/A – The capabilities are not yet fielded

PROPOSED EXPERIMENT OVERVIEW

- The DroneFox seeks to detect, identify and mitigate inbound sUAS. This includes done location, altitude, speed(v/h), battery life and video feed. DroneFox then mitigates via force landing, return home, etc.
- The DroneFox does not use jamming technology. It uses proprietary technology to cycle through the kill chain and gives the user complete control over this process. A range of up to 1 kilometer also differentiates the DroneFox.

TECHNICAL INFORMATION

Hardware

- **Dimensions:** 20.5” x 11.31” x 6.75”
- **Weight:** 10lbs
- **Power:** Internal Battery

Software

- **Required Processor (optimal performance):** N/A
- **File Size/connection speed:** N/A
- **Interoperable Standards:** N/A

Operating Principles

1) **Austere by Design.** – JIFX is conducted in an expeditionary setting: minimal infrastructure, occasional harsh weather, no immediate access to additional resources. Participants are expected to bring what they need, as if deploying.

2) **Bounded, Not Controlled.** – JIFX provides a safe, secure and legal experimental "sandbox." We foster innovation by not scripting the event.

3) **Failure is Success.** – JIFX provides a safe place to push prototypes to the point of failure so companies can build better products faster.

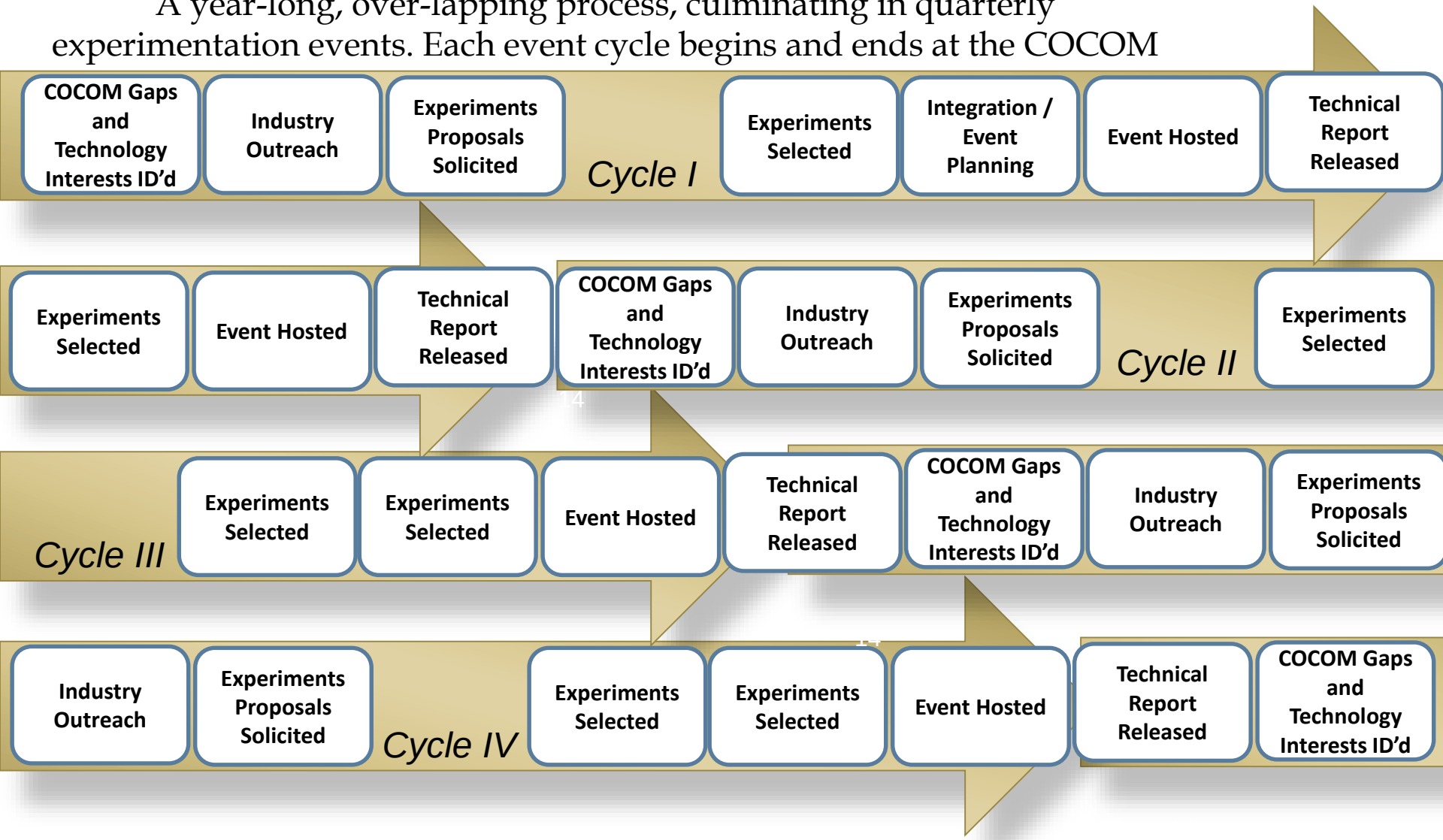
4) **Develop. Now.** – JIFX encourages developers to actively develop during the event. Failure provides insight, in-field development immediately captures that insight so they can fail again in new ways.

5) **Be Inclusive.** – Other participants, COCOM S&T advisors, active duty military, and graduate students from NPS and other universities all observe the experiments and provide feedback and suggestions to the developers.

6) **Collaborate.** – JIFX expects participants to collaborate with each other. Companies integrate their technologies with others to develop more complete solutions.

Process

A year-long, over-lapping process, culminating in quarterly experimentation events. Each event cycle begins and ends at the COCOM



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